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# Computer-Assisted Diagnosis of Acute Abdominal Pain

## BUMED Film Teaches Submariners How It's Done

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Carl Black

*The health care of submarine crews on patrol poses a special problem for the Navy. While on patrol, crewmembers are away from primary sources of medical support for extended periods of time. During times when a submarine must operate under radio silence, even the relayed advice of a doctor cannot be sought until after an illness has been determined to be critical. For these reasons, submarine crews are perhaps the best medically screened personnel in the Navy.*

*But in spite of this screening, it is inevitable that a few of these people will develop serious medical problems. And when a medical crisis occurs, it will be the job of the submarine's corpsman, the sole medical expert aboard, to diagnose the illness, treat it, or—and this is very important—recommend to the captain that the patient be evacuated to a primary medical care facility.\**

The question of whether to evacuate an ill crewmember is, indeed, a

serious one. Because an evacuation exposes the submarine's position, the submarine's mission may be compromised, thus, directly affecting national defense. Evacuation can also be dangerous to the patient and the rescuers. Further, an individual evacuation can be expensive, costing many thousands of dollars.

Although many medical evacuations are necessary and appropriate, some are unnecessary. In the latter case, errors are made in diagnosis or in the assessment of the appropriateness of treating the illness aboard the submarine. (1)

The Navy has taken two separate approaches to the problem of unnecessary medevacs. The Naval Medical Research and Development Command (NMRDC), through work at the Naval Submarine Medical Research Laboratory (NSMRL), has been studying the use of computer technology to aid submarine corpsmen in patient management decisions: diagnosis, prognosis, and treatment. (2) The system it has developed utilizes a microcomputer already aboard nuclear submarines and deals primarily with acute abdominal pain, the most frequently encountered evacuable condition. (1) At the Naval School of Health Sciences Education and Training Command (HSETC), a training program is under development to refresh and update the training of

corpsmen reporting to or already assigned to submarines. This program combines individual study and clinical experience. Instructional materials are now being developed and a prototype clinical training program has been instituted at the Naval School of Health Sciences, Portsmouth, VA. (3)

At NSMRL, it was found that using a computer requires a structured, organized approach to physical diagnosis, and that each item of data be defined well and explicitly. Also, studies indicated that in order for the computer programs to work, it is vital that independent duty or submarine corpsmen be trained according to these definitions and procedures for gathering data. (2) A great need existed for instructional tools to teach these skills.

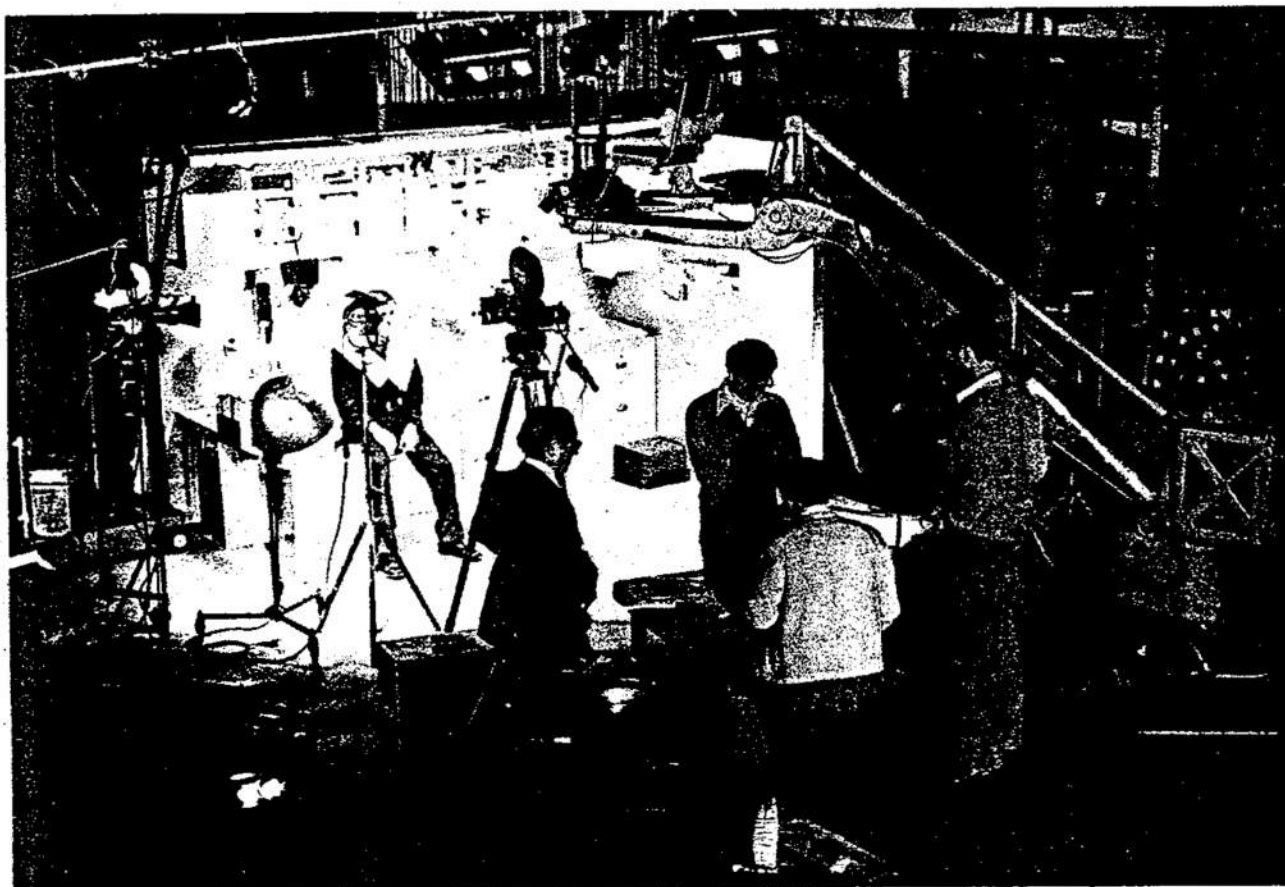
HSETC had a similar need. It was recognized that any submarine corpsman refresher course had to deal with diagnosis and management of abdominal pain. An organized, well-defined approach to abdominal pain diagnosis required by a computer could meet the requirements for a criterion-referenced physical diagnosis course. It could provide the basis for a no-frills approach, where specific abdominal pain diagnosis skills are taught and where a limited objective such as the stabilization of a patient is sought.

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\*From the introduction to *Computer-Assisted Diagnosis of Acute Abdominal Pain*.

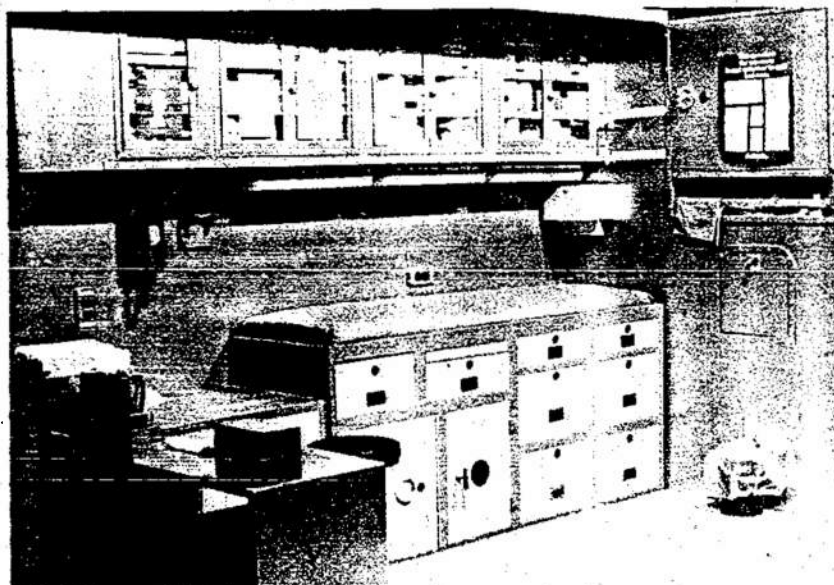




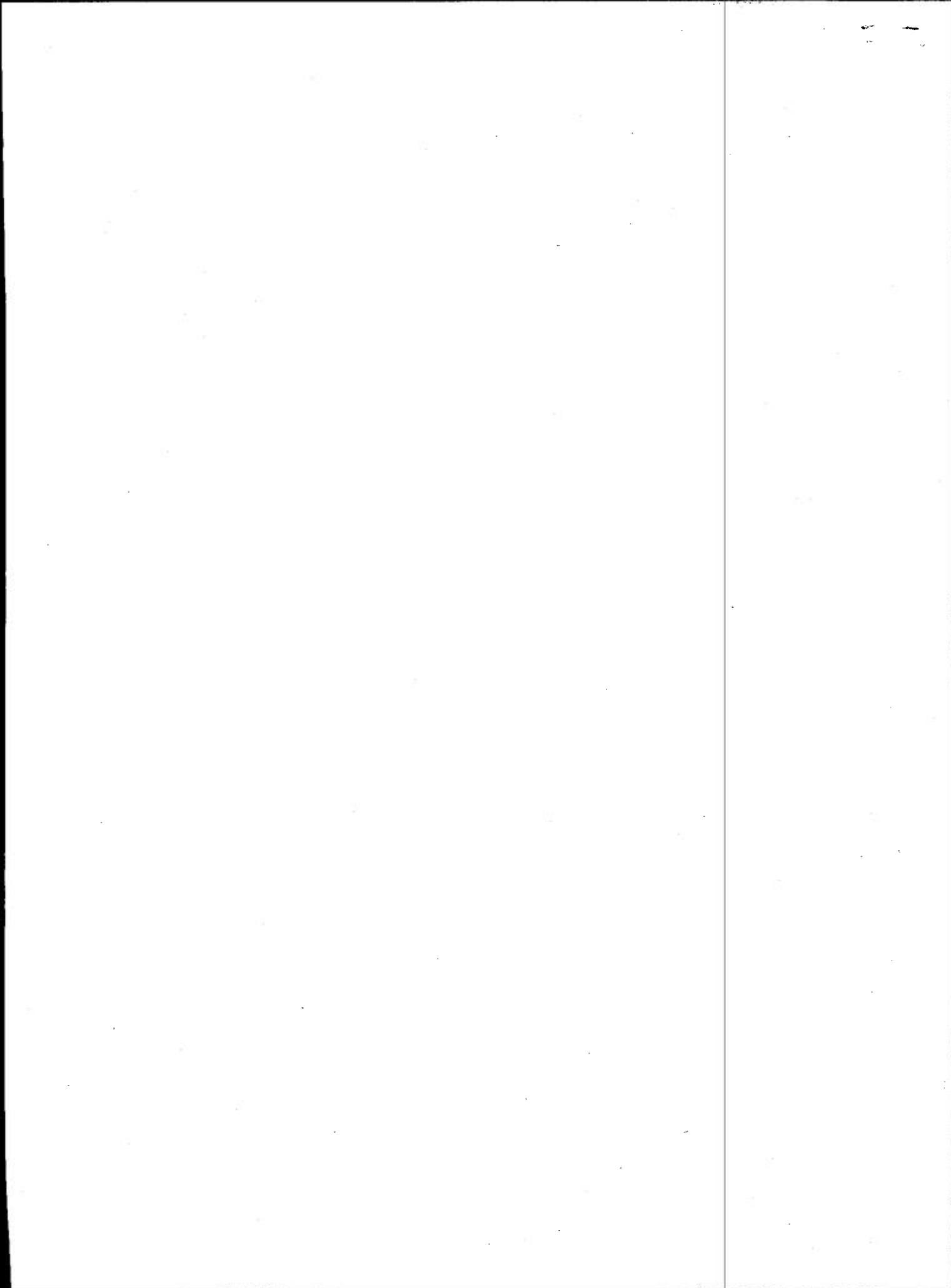
*Actor Bob Armstrong waits on sick bay set as Director Carl Black (seated) gives instructions.*

A partnership of mutual benefit was developed between NMRDC and HSETC that addressed the medevac question. The collaboration has resulted in the production of a film that can be used either to train corpsmen for computer-aided diagnosis or serve as the basis of a videotape that can aid in refresher training of submarine (and other independent duty) corpsmen.

*Computer-Assisted Diagnosis of Acute Abdominal Pain* (MM-0000) takes place in the sick bay of a Polaris submarine. For convenience and to minimize cost, a set that elaborately duplicates the sick bay of a nuclear submarine was constructed at the Naval Photographic Center (NPC) in Washington, DC. The film was shot using NPC staff



*The set duplicates in detail the sick bay of a Polaris submarine. In addition, NPC furnished its full in-house support: production facilities, stage and film crews, animation, and film-processing support.*



and on the NPC sound stage where, in the 1940s, such actors as Gene Kelly and Jackie Cooper participated in the production of BUMED training films (see *U.S. Navy Medicine*, April 1979). In lending this assistance, NPC served as a coproducer of the film.

The film begins with scenes showing an evacuation from a U.S. Navy nuclear submarine that actually occurred in the North Atlantic during a winter patrol. This footage, provided by the British Broadcasting Company, emphasizes the inherent dangers of such an operation by showing a patient, strapped into a Stokes stretcher, washed overboard while being prepared for helicopter evacuation. Fortunately, the patient is recovered by the British helicopter rescue team.

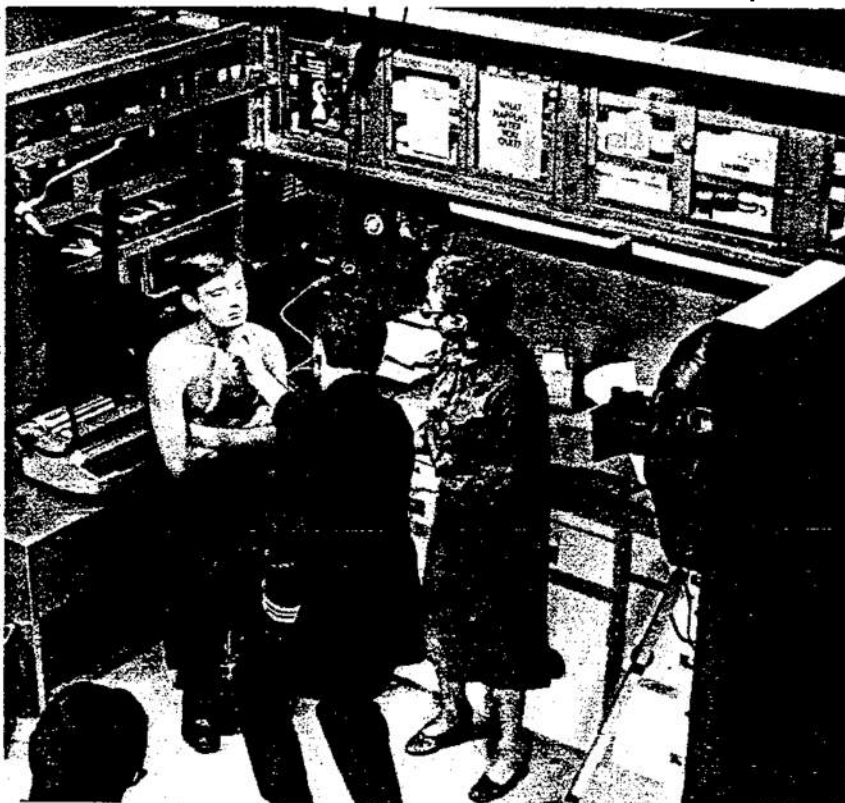
Actors playing the part of patient

Photo by PH1 Douglas Klotzbach



Dr. Joe Henderson demonstrates Murphy's sign to professional actors Frank Stoegerer and Bob Armstrong on the NPC set.

Photo by Robert Beltz



The difficult portrayal of pathologic changes in skin color required the talents of Lillian Brown, a makeup specialist who provided makeup for several Presidents, including President Carter.

and corpsman then demonstrate methods of obtaining specific history and physical examination information. The film takes the student through the history and physical examination item by item following a prescribed data sheet. For each item the actors, patient and corpsman, interact as the narrator emphasizes do's and don'ts. For example, in the category "Color," the importance of color as a diagnostic indicator is stressed as it relates to flushing, pallor, cyanosis, and jaundice.

Dr. F.T. deDombal of the University of Leeds, England, provided the original abdominal pain computer program to the Navy and acted as technical consultant for the film. (4) In addition to establishing many of the criteria for data-gathering depicted in the film, his review of the script was of great value.

The film represents collaboration at many levels—within BUMED, within the Navy, and within the international medical community. This joint effort will serve to improve health care and preserve the operating strength of our submarine force.

## References

1. Blankenship W: *Annual Workshop for Submarine Corpsmen*, Norfolk, VA, October 1978.
2. Henderson JV, Moeller G, Ryack BL, Shumaik GM: Adaptation of a Computer-Assisted Diagnosis Program for use by Hospital Corpsmen Aboard Nuclear Submarines. *Proc 2nd Symp on Computer Applications in Medical Care*, IEEE, 1978.
3. Dutton BD: Refresher Training for Submarine Corpsmen: A Working Model. *U.S. Navy Medicine* 70(12):18-20, December 1979.
4. deDombal FT: Surgical Diagnosis Assisted by a Computer. *Proc Royal Soc Lond B* 184, 433-470. □

\*Ed. note: 16 mm prints of the film will be available in the near future. In the meantime, activities can request ¼-inch videocassettes by writing the Audiovisual Resources Branch, HSETC, Bethesda, MD 20014.

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 government has been unable to  
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 has led to a loss of confidence  
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 The third is the fact that  
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 system. This has led to a  
 loss of confidence in the  
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